<9.11~9.15절>

9.113 $m = \rho t A = \rho t\left(\frac{1}{2}\pi a^2\right)$

$I^{mass} = \rho t I^{area} = \frac{2m}{\pi a^2} I^{area}$

(a) $I_{BB'}^{area} = I_x^{area} - A\bar{y}^2$

$= \frac{1}{8}\pi a^4 - \left(\frac{1}{2}\pi a^2\right)\left(\frac{4a}{3\pi}\right)^2 = \pi a^4\left(\frac{1}{8} - \frac{8}{9\pi^2}\right) = \frac{\pi}{8}a^4\left(1 - \frac{64}{9\pi^2}\right)$

$I_{BB'}^{mass} = \frac{2m}{\pi a^2} I_{BB'}^{area}$

$= \frac{2m}{\pi a^2}\frac{\pi}{8}a^4\left(1 - \frac{64}{9\pi^2}\right) = \frac{1}{4}ma^2\left(1 - \frac{64}{9\pi^2}\right) = 0.0699\ ma^2$

(b) Fig. 9.12에서, $I_{AA'}^{area} = \frac{1}{8}\pi a^4$

$I_{AA'}^{mass} = \frac{2m}{\pi a^2} I_{AA'}^{area}$

$= \frac{2m}{\pi a^2}\frac{1}{8}\pi a^4 = \frac{1}{4}ma^2$

$\bar{I}_{CC'}^{mass} = I_{AA'}^{mass} + I_{BB'}^{mass}$

$= 0.250\ ma^2 + 0.0699\ ma^2 = 0.320\ ma^2$

9.116 $\bar{X} = 0$

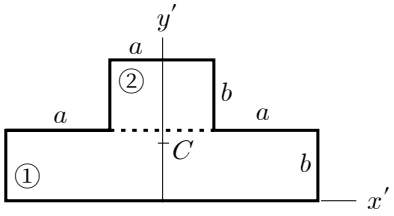
$\bar{y}_1 = \frac{1}{2}b, \quad A_1 = 3ab$

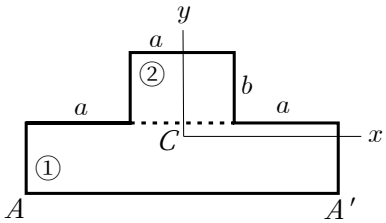
$\bar{y}_2 = \frac{3}{2}b, \quad A_2 = ab$

$\Sigma A = 3ab + ab = 4ab \quad (m_1 = \frac{3}{4}m,\ m_2 = \frac{1}{4}m)$

$\Sigma(\bar{y}A) = \frac{1}{2}b(3ab) + \frac{3}{2}b(ab) = 3ab^2$

$\bar{Y} = \frac{3ab^2}{4ab} = \frac{3}{4}b$





(a) $I_{AA'} = (I_{x'})_1 + (I_{x'})_2$

$= \frac{1}{3}\left(\frac{3}{4}m\right)b^2 + \left[\frac{1}{12}\left(\frac{1}{4}m\right)b^2 + \left(\frac{1}{4}m\right)\left(\frac{3}{2}b\right)^2\right] = mb^2\left[\frac{1}{4} + \frac{1}{48} + \frac{9}{16}\right] = \frac{5}{6}mb^2$

(b) $\bar{I}_x = I_{AA'} - m\bar{Y}^2 = \frac{5}{6}mb^2 - m\left(\frac{3}{4}b\right)^2 = \frac{13}{48}mb^2$

$\bar{I}_y = (I_y)_1 + (I_y)_2 = \frac{1}{12}\left(\frac{3}{4}m\right)(3a)^2 + \frac{1}{12}\left(\frac{1}{4}m\right)a^2 = \frac{7}{12}ma^2$

$\bar{I}_{CC'} = \bar{I}_x + \bar{I}_y = \frac{13}{48}mb^2 + \frac{7}{12}ma^2 = \frac{m}{48}(28a^2 + 13b^2)$

9.117 $m = \rho t A = \rho t \left(\frac{1}{2} b h\right)$

$$I^{mass} = \rho t I^{area} = \frac{2m}{bh} I^{area}$$

(a) $\bar{I}_{AA'}^{area} = 2\left[\frac{1}{12}(h)\left(\frac{b}{2}\right)^3\right] = \frac{1}{48} b^3 h$

$$\bar{I}_{AA'}^{mass} = \frac{2m}{bh} \bar{I}_{AA'}^{area} = \frac{2m}{bh} \frac{1}{48} b^3 h = \frac{1}{24} m b^2$$

$$\bar{I}_{BB'}^{area} = \frac{1}{36} b h^3$$

$$\bar{I}_{BB'}^{mass} = \frac{2m}{bh} \bar{I}_{BB'}^{area} = \frac{2m}{bh} \frac{1}{36} b h^3 = \frac{1}{18} m h^2$$

(b) $I_{CC'}^{mass} = \bar{I}_{AA'}^{mass} + \bar{I}_{BB'}^{mass} = \frac{1}{24} m b^2 + \frac{1}{18} m h^2 = \frac{m}{72}(3b^2 + 4h^2)$